



Reliability and Cost Consideration Nov. 6, 2012

Supporting the 2012 revision to the Washington emissions performance standard for baseload electric generation

Introduction

In 2007 Washington established a greenhouse gas (GHG) emission performance standard (EPS) for baseload electricity generation. The law requires the Department of Commerce (Commerce) to update this standard very five years. This document considers the effects of a proposed update to Washington's EPS on electric system reliability and overall costs to electricity consumers. The EPS is codified in Revised Code of Washington (RCW) chapter 80.80.

RCW 80.80.060(1) prohibits utilities from acquiring through long-term contract (5 years or greater in length) electric power produced by a baseload¹ generating resource(s) that exceed the emissions performance standard. Short-term contracts of less than 5 years are allowed. Utilities are also prohibited from building or purchasing baseload generation resources that exceed the emission performance standard. Investor-Owned Utilities (IOUs) may apply to the Washington State Utilities and Transportation Commission (UTC) for exemptions to the law based on certain reliability and cost criteria: Paragraph 80.80.060(4). The governing boards of consumer-owned utilities are also authorized to make exemption determinations on similar criteria: Paragraph 80.80.070(4).

The focus of this document is on the marginal effects of the proposed reduction from the current standard of 1,100 lb/MWh (pounds per megawatt-hour) to a proposed value of 980 lb/MWh, which is scheduled to become effective in January 2013. A reliability and cost consideration² is required under subsection 80.80.040(11) which reads as follows:

In adopting and implementing the greenhouse gas emissions performance standard, the department of commerce energy policy division, in consultation with the [Utilities and Transportation] commission, the department [of Ecology], the Bonneville power administration, the western electricity coordinating council, the energy facility site evaluation council, electric utilities, public interest representatives, and consumer representatives, shall consider the effects of the greenhouse gas emissions performance standard on system reliability and overall costs to electricity consumers.

The law does not make clear whether the reliability and cost consideration is to be conducted just once at the initial passage of the law, or each time the standard is adjusted. Commerce and the UTC conducted a limited reliability and cost consideration in 2007 after the initial passage of the law. Commerce has prepared this consideration of the 2012 EPS adjustment voluntarily in order to inform the decision fully, whether or not any legal requirement exists. This consideration focuses on statewide and system impacts, which may be different than cost and reliability

¹ Baseload resources are those permitted to operate 60 or more percent of the time.

² The law calls for a 'consideration' which Commerce interprets as something less than a comprehensive analysis that considers the detailed potential impacts on each of the state's electric utilities.

impacts for individual utilities. Commerce does not have the detailed information or analytical resources to evaluate individual impacts for each utility. As noted in the second paragraph above, the law does provide for exemptions due to specific reliability or cost impacts on a utility.

The EPS law was designed to regulate utility contracts with, and ownership of, baseload generators emitting above the EPS. Coal-fired generators emit above the current EPS of 1,100 lb/MWh so their status will not change with the anticipated lowering of the standard and consequently are not discussed in this document. Likewise, two natural gas-fired combined cycle combustion turbine (CCCT) facilities in Washington³ exceed the current EPS of 1,100 lb/MWh and are also unaffected by any lowering of the standard. Two other CCCTs have emissions below the current 1,100 lb/MWh EPS but above the proposed 980 lb/MWh EPS and are likely to be impacted by the proposed change in EPS. Simple cycle combustion turbines exceed the current and proposed EPS, but are very rarely permitted as baseload power plants - therefore RCW 80.80 does not apply to simple cycle turbines.

Supporting Information

S1. The EPS survey methodology

The EPS survey methodology (frequently referred to as the “EPS calculator” during stakeholder meetings) is the key piece of work done to establish the proposed EPS value. The survey methodology incorporates a series of performance adjustment steps, which are used to modify the reference CCCT performance values.⁴ The reference performance values are published annually in Gas Turbine World (GTW).

In order to show compliance with the law, operators of new CCCTs are required to submit actual emissions data. The adjustments account for ageing and sub-optimal CCCT operation and allow Commerce to forecast the operational or ‘real world’ GHG emission rates based on the reference rates published for each CCCT. Nineteen models of nationally available CCCTs were evaluated in the EPS survey to establish the average GHG emission rate, which represents the EPS update value of 980 lb/MWh. S1 summarizes the steps to arrive at the updated EPS value. A brief description of the methodology can be found in Appendix A.

³ The CCCTs in this grouping are the Big Hanaford Plant near Centralia, and the Encogen Plant near Ferndale. The Big Hanaford plant is based on a less efficient design and may be run in a less efficient mode as a simple cycle plant. The Encogen plant was a cogeneration facility that no longer has a thermal host and therefore is now less efficient than a typical CCCT.

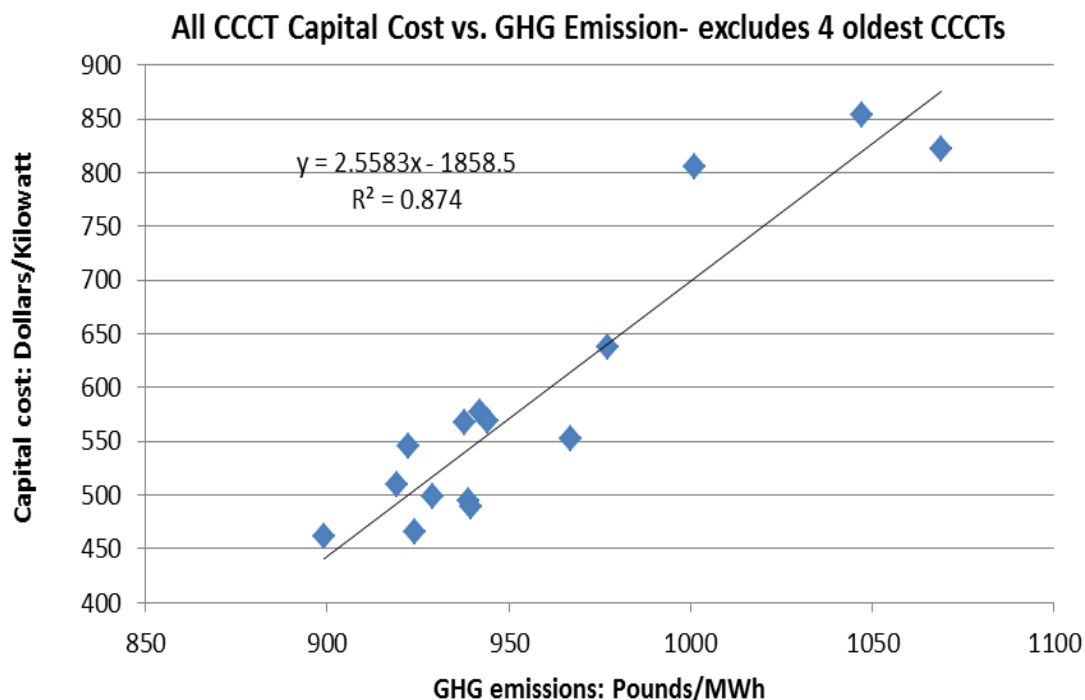
⁴ The CCCT performance values used in this study were heat rate (Btu/kWh) and emission rate (lb GHG/MWh). The performance adjustment process increased the reference heat rate by nearly 22 percent.

Manufacturer and model	Design year	Nominal class	format	Net rated output	Net clean and new heat rate				adjusted heat rate Btu _{HHV} /kWh	duct firing heat rate Btu _{HHV} /kWh	adj. heat rate w/ duct firing Btu _{HHV} /kWh	Heat rate adj. for stop/start/ partial load Btu _{HHV} /kWh	Heat rate adj. for Climate and Inlet Cooling Btu _{HHV} /kWh	Theoretical efficiency percent	emission rate lb. GHG/MWh
					Btu _{LHV} /kWh	Btu _{HHV} /kWh	Emission rate	Efficiency							
Alstom															
KA24-2	1996	F	2 X 1	660	5,853	6,484	763	53%	6,857	9,400	7,302	7,740	7,896	44%	929
General Electric															
1106FA	1991	F	1 X 1	119	6,199	6,868	808	50%	7,262	9,750	7,724	8,188	8,352	42%	982
206FA	1991	F	2 X 1	239	6,132	6,794	799	50%	7,184	9,750	7,646	8,104	8,267	42%	972
S107FA	2008	F	1 X 1	277	5,948	6,590	775	52%	6,968	9,400	7,414	7,858	8,016	43%	943
S207FA	2008	F	2 X 1	542	5,889	6,524	767	52%	6,899	9,400	7,344	7,785	7,942	44%	934
S107EA	1977	E	1 X 1	135	6,680	7,401	870	46%	7,826	9,750	8,288	8,785	8,962	39%	1054
S207EA	1979	E	2 X 1	270	6,695	7,417	872	46%	7,843	9,400	8,289	8,786	8,963	39%	1054
LM2500+G4 RC	2005	Aero	1 X 1	48.9	6,819	7,555	888	45%	7,988	9,750	8,451	8,958	9,138	38%	1075
LM6000PF Sprint	2006	Aero	2 X 1	123	6,365	7,052	829	48%	7,457	9,750	7,919	8,394	8,563	41%	1007
Mitsubishi															
MP1CP1(M501G)	1995	G	1 X 1	399	5,843	6,473	761	53%	6,845	9,400	7,291	7,728	7,883	44%	927
MP2CP2(M501G)	1995	G	2 X 1	800	5,823	6,451	759	53%	6,822	9,400	7,267	7,703	7,858	44%	924
MP1CP1(M501F)	1994	F	1 X 1	285	5,976	6,621	779	52%	7,001	9,400	7,446	7,893	8,052	43%	947
MP2CP2(M501F)	1994	F	2 X 1	572	5,955	6,597	776	52%	6,976	9,400	7,422	7,867	8,025	43%	944
Siemens															
SGT6-8000H 2S	2010	H	2 X 1	820	5,687	6,301	741	54%	6,662	9,400	7,108	7,534	7,686	45%	904
SCC6-5000F	1989	F	1 X 1	307	5,990	6,636	780	51%	7,017	9,400	7,463	7,911	8,070	43%	949
	1989	F	2 X 1	620	5,960	6,603	777	52%	6,982	9,400	7,428	7,873	8,032	43%	945
SCC6-2000E/F	1989	E	1 X 1	171	6,626	7,341	863	46%	7,762	9,750	8,224	8,718	8,893	39%	1046
	1989	E	2 X 1	342	6,560	7,268	855	47%	7,685	9,400	8,131	8,618	8,792	40%	1034
USCC-700	1998	Aero?	1 X 1	44	6,672	7,392	869	46%	7,816	9,750	8,278	8,775	8,951	39%	1053
averages and totals															
Averages (Heat Rate or Efficiency)					6,193	6,861	807	50%	7,255		7,707	8,169	8,334	42%	980

S1: Washington State survey of new, commercially available, and purchased CCCTs. The emission rates averaged to produce the proposed EPS of 980 lb/MWh appear in the rightmost column.

S2. Cost of new, commercially available and purchased CCCTs.

The capital costs per kilowatt of capacity for each of the nineteen CCCTs evaluated in the survey methodology were also obtained from GTW. A plot of GHG emission rate versus capital cost for the nineteen CCCTs surveyed is shown in S2. The chart excludes the four oldest CCCTs that are listed in S1 above, which are no longer purchased frequently. Commerce tested for a relationship between turbine capital cost per kilowatt, and emission rate per megawatt-hour. It appears there is a moderate, positive correlation: turbines with higher emissions rates have higher capital costs ($R^2 = 0.874$). If the four oldest CCCTs are included the coefficient of determination drops from $R^2 = 0.874$ to $R^2 = 0.438$.



S2 - Relationship between emissions rate and capital cost of new, combined cycle combustion turbines.⁵ Turbines with a higher emissions rate (“dirtier” turbines) generally exhibit a higher capital cost per kilowatt of capacity.

S3. Review of recently ordered (purchased) CCCTs in the U.S.

Gas Turbine World reports new turbine orders, including CCCTs, by utilities, independent power producers and others on a periodic basis. To get a sense of the number and type of turbines ordered Commerce reviewed the GTW reports from mid-2004 through mid-2010. General Electric CCCT's based on the 7FA and Siemens CCCT's based on the 5000F were by far the most common machines ordered⁶. These two CCCTs are very efficient, though not the most efficient CCCT that can be ordered. There are several versions of each of these models

⁵ Cost per unit capacity taken from 2011 and 2012 Gas Turbine World Handbooks. Estimated GHG emissions were derived using the August 3rd EPS calculator. The above chart and supporting data are available in the EPS calculator.

⁶ Both the 7FA and 5000F based CCCTs are commonly referred to as F class machines.

reflecting specific needs of the purchaser and continual technological advances. A brief summary of the orders is presented in S3. Note that these represent orders and not installations since orders can be cancelled.

Manufacturer	Model	Count	Manufacturer total
GE	LM6000PC	1	31
	LM6000PF	1	
	6 & 7FA	25	
	7EA	4	
Mitsubishi	M501G	7	8
	M501F	1	
Siemens	SCC6-2000E ?	1	27
	SCC6-3000E	1	
	SCC6-8000H	2	
	SCC6-5000F	22	
	SCC-800	1	
CCCT total		66	

S3: U.S. CCCT Orders 2004-2010 as Reported by Gas Turbine World

S4. Reported Versus Calculated GHG Emissions

Existing CCCTs were evaluated using the EPS survey methodology to determine if the methodology produced values consistent with actual turbine operations. Commerce identified the type and vintage for existing CCCTs in Washington and Oregon and ‘ran’ the EPS survey on these CCCTs to estimate their emissions. Reported GHG emission values (2010) for the existing CCCTs were paired with the EPS survey estimates and are presented in S4a and S4b. The two CCCTs that exceed the current EPS are shown in italics, while the two CCCTs likely to exceed the proposed EPS are shown in bold. These four CCCTs share some characteristics: they are older, earlier vintages, smaller and two are cogeneration units.

Looking at the entire group of CCCTs it can be seen that the calculated and reported emission rates are fairly close: 957 versus 945 lb/MWh. However, it is actually more reasonable to exclude the two highest emitting existing CCCTs from the average. The Big Hanaford facility is primarily being run for short periods as a simple cycle turbine (leaving the steam turbine unused) and consequently has much higher than expected emissions. The Bellingham facility was designed as a co-generation plant, but the paper mill that was its thermal host closed about 8 years ago, which explains the high emission rate for this plant.⁷ If the Bellingham and the Big Hanaford facilities are excluded the average calculated emission rate for the remaining CCCTs is much higher than the reported emission rate: 939 versus 866 lb/MWh. This suggests that the performance adjustment factors in the EPS survey methodology are generous and that the proposed EPS update value of 980 lb/MWh is lenient.⁸ Supplemental information S4b illustrates

⁷ The Washington EPS gives credit for cogeneration thermal energy. The Bellingham facility no longer supplies the paper mill with thermal energy and cannot take this emission credit.

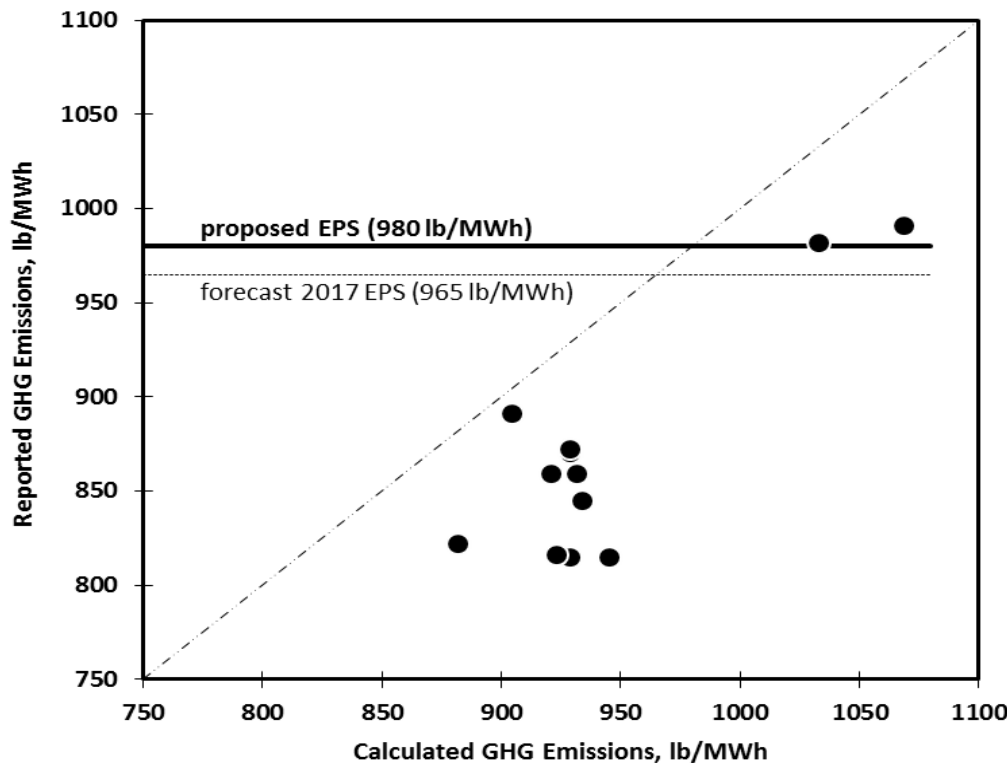
⁸ The leniency is intentional: compliance is determined on an annual basis, but turbine major maintenance is undertaken on approximately five year intervals. CCCTs need some performance “headroom” to operate in the

that most of the existing CCCTs easily meet the proposed EPS update value of 980 lb/MWh and will meet a hypothetical 2017 EPS update as well.

S4a: Calculated and Reported GHG Emissions for the Current WA/OR Fleet of CCCTs

Facility	Ownership	CCCT model	Nominal class	Start year	Capacity (MW)	Est. heat rate (new & clean)	Adjusted heat rate	Calculated emission rate	Reported emission rate 2010
						BtuHHV/kWh	BtuHHV/kWh	lb GHG/MWh	lb GHG/MWh
Chehalis	utility	207FA	F	2003	520	6,725	7,689	904	891
Mint Farm	utility	107FA	F	2008	319	6,747	7,941	934	845
Frederickson	utility/independent	107FA	F	2002	270	6,747	7,923	932	859
Grays harbor	independent	207FA	F	2008	620	6,692	7,899	929	870
Goldendale	utility	S107FA	F	2004	250	6,747	7,899	929	815
Hermiston	utility/independent	S107FA	F	1996	475	6,869	8,038	945	815
River Road	utility	S107FA	F	1997	250	6,848	7,830	921	859
Coyote Springs 1	utility	S107FA	F	1995	266	6,882	7,898	929	872
Coyote Springs 2	utility	S107FA	F	2003	287	6,747	7,850	923	816
Port Westward	utility	M501G	G	2007	500	6,473	7,497	882	822
Ferndale	independent	S107EA	E	1994	245	7,684	9,087	1,069	991
Sumas	utility	S107EA	E	1993	125	7,684	8,786	1,033	982
Bellingham	utility	106C	Frame 6	1993	160	7,865	8,993	1,058	1,407
Big Hanaford	independent	LM6000PC	Aero	2002	248	7,279	8,577	1,009	1,389
							Averages	Calculated	Reported
							All CCCTs	957	945
							Excludes 2 highest	939	866
							Newest CCCTs	919	845

final one or two years of their maintenance cycle. In addition infrequent operation of a CCCT in a particular year will result in a higher annual GHG emission rate, which also argues in favor of leniency.



S4b: Emission rates reported by 12 CCCTs located in or near Washington. The CCCTs are ordered on the horizontal axis by the calculated emission rate for that make and model according to Commerce’s survey methodology. If a CCCT falls below the dashed, diagonal line then its actual emissions rate is less than its calculated emission rate. The thick, horizontal line is the proposed EPS of 980 lb/MWh, and the light, horizontal line is a forecast value for the survey result in 2017 – 965 lb/MWh. Ten of the 12 turbines fall below both the proposed EPS and the forecast survey result in 2017.

S5. CCCT Generation as a Fraction of Washington Electricity Sales

Commerce used its Fuel Mix Disclosure report⁹ and a recent survey of three IOUs¹⁰ to estimate the share of electric generation attributable to CCCTs during calendar years 2009-2011. The Utilities and Transportation Commission conducted the survey of CCCTs; some of the survey data is considered proprietary by the utilities and hence is reported here only in aggregate. CCCTs provided 9.4 percent of Washington’s electricity supply; that generation was divided between CCCTs owned by utilities (6.8 percent of the state total) and CCCTs with long-term contracts (2.5 percent). The surveyed IOUs reported no short-term contracts. Long-term contract power from the single CCCT at risk from the proposed EPS update is 0.6 percent of Washington’s electricity supply.

⁹ <http://www.commerce.wa.gov/site/539/default.aspx>

¹⁰ The IOUs own a majority of the CCCTs in Washington, Oregon and Idaho and also are the principal utilities having long-term contracts with independently operated CCCTs. Clark Public Utilities does own a CCCT that partially serves its own load, with BPA contracting for the excess generation. Avista and PacifiCorp operate in multiple states so their CCCTs are prorated to the current customer shares.

Sales or generation share	2009	2010	2011	3-year avg.	
	thousand MWh	thousand MWh	thousand MWh	thousand MWh	share percent
Washington electric sales	88,876	88,544	91,106	89,509	100.0%
Share generation by CCCTs	9,605	10,076	5,584	8,422	9.4%
Share generation by CCCTs under long-term contract	2,101	2,875	1,869	2,282	2.5%
Share generation by CCCTs under long-term contract with EPS risk	846	645	80	524	0.6%

S5: Ownership and Contractual Status of Natural Gas Generation in WA: 2009-2011.

S6. Future EPS updates

Commerce evaluated the increase in gas turbine efficiency over time for several models¹¹ and estimates that in the near-term efficiency will improve 0.3% per year (relative change). If other factors in the EPS survey remain the same this suggests an EPS update in 2018 to 965 lb/MWh, which will cover the period from 2018-22. This value is illustrated in S4b.

S7. Future CCCT builds by Washington utilities

There have been several proposals for new CCCTs in the Pacific Northwest. The three IOUs in their integrated resource plans (IRPs)¹², forecast electricity load growth and new resource needs¹³. Avista and PacifiCorp operate in multiple states so their natural gas-fired resource acquisitions (CCCTs and SCCTs) are prorated to the current customer shares. This likely overestimates the Washington share for new resources since electric load growth is likely higher in the non-Washington service areas. The new resource needs are summarized in Supporting Information S7.

¹¹ The information supporting this figure are from a GE presentation and a series GTW annual reports on CCCTs.

¹² PSE: http://pse.com/aboutpse/EnergySupply/Documents/IRP_2011_chapters.pdf

Avista: <http://www.avistautilities.com/inside/resources/irp/electric/Documents/2011%20Electric%20IRP.pdf>

PacifiCorp:

http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2011IRP/2011IRP-MainDocFinal_Vol1-FINAL.pdf

¹³ Consumer-owned utilities in Washington are much less likely to build CCCTs. Commerce is not aware of any current, specific plans by Washington's consumer-owned utilities to construct or purchase CCCTs.

Utility	SCCT	CCCT	Total
PSE	1278	0	1278
Avista (WA)	99.1	0*	99.1
PacifiCorp (WA)	147	388	535
Total	1,524	388	1,912

* Avista is forecasting a 2024 start date for a CCCT.

S7: IOU Forecast Natural Gas-Fired Resource Acquisitions through 2023: MW Capacity.

Impact on reliability of the electric system

Supporting Information S5, *CCCT generation as a fraction of Washington electricity sales* shows that during the period 2009-2011 9.4 percent of all electricity sold in Washington was provided by CCCTs. 71 percent of this share, or 6.8 percent of electricity sales, was from CCCTs owned by utilities which, whether or not they meet the EPS, can continue to serve their own utility load without penalty. The remaining 29 percent of CCCT generation, representing 2.5 percent of Washington's total electricity supply, is under long-term contract, and hence exposed to the EPS when their contract ends.

Though Commerce expects 2.5 percent of Washington's electricity supply to be exposed to the EPS in the foreseeable future, only a fraction of that supply will be affected by the *change* in EPS from 1100 to 980 lb/MWh. Supporting Information S4, *Reported Versus Calculated GHG Emissions*, indicates that nearly all Northwest baseload CCCTs are either above the original EPS of 1100 lb/MWh or below the proposed EPS of 980 lb/MWh. There are two facilities that meet the current EPS, but will have difficulty meeting the proposed EPS. One of these is owned by a utility and will still be able to service utility load without any contractual constraint. The remaining, single facility, Ferndale, is the only facility likely to face a meaningful change in regulatory environment due to the lowering of the EPS from 1100 lb/MWh to 980 lb/MWh. The Ferndale plant has generated 1,571 thousand MWh during 2009-2011 period, or 0.6 percent of Washington's electricity sales: 358,035 thousand MWh.

The law does not prohibit or limit the operations of any existing electric generating resources in the Western Energy Coordinating Council (WECC) region. Existing resources that exceed the updated standard will be limited to contract lengths less than 5 years (short-term contracts) when entering new power purchase agreements (PPAs) with Washington utilities, but this does not prohibit their ability to operate to meet load.

Since only 0.6 percent of Washington's electricity supply is expected to operate with different regulatory constraints after the change in EPS, and since those different regulatory constraints continue to allow operation on short-term contracts, Commerce concludes that the marginal impact of the proposed EPS on system reliability will be negligible.

Commerce received a number of comments from stakeholders expressing concerns about the EPS impact on system reliability. A few key comments and Commerce's responses are presented below.

Stakeholder Concern 1: Commerce assumed optimal operation of CCCTs when developing the EPS. In actuality CCCTs are operated to balance load and integrate intermittent renewable resources. Consequently they undergo frequent starts and stops and ramp from full to partial load, which drives them to non-compliance. A lower EPS will force CCCTs to choose between compliance and flexible operation necessary for grid reliability.

Response: The EPS survey incorporates the effects of frequent startup and shutdown cycling and low output on overall emission rates. As S1 indicates the adjustment steps in the survey used to arrive at the proposed EPS increased GHG emissions by 22% from the levels associated with optimal or reference operation. Commerce considers the proposed EPS to be quite lenient¹⁴ as evidenced by the comparison of calculated versus reported emissions for existing CCCTs, shown in Supporting information S4a and S4b. The table and figure illustrate that the GHG emission values for existing CCCTs calculated using the EPS survey methodology significantly exceed the reported values. If Commerce finds that CCCTs are operated using even more aggressive startup and shutdown and ramping when the next update of the EPS takes place, the operational adjustment factors will be changed.

Stakeholder Concern 2: Utility and Independent Power Producer (IPP) choice will be reduced when selecting new CCCTs (only the most efficient CCCTs will be allowed), delaying and increasing the cost of projects, thereby impacting system reliability.

Response: Federal regulations and fuel prices are also pushing utilities and IPPs to purchase more efficient CCCTs. S1 presents the CCCTs evaluated in the EPS survey and allows one to see which CCCTs are the most efficient and have the lowest GHG emissions. New U.S. orders for CCCTs are summarized in S3 and reveal that approximately 80 percent of CCCT orders were for the more efficient CCCTs. These cleaner and more efficient CCCTs are the type found in recent CCCT builds and the new project proposals in the Northwest.

Stakeholder Concern 3: New CCCTs will not be built due to the inability to meet future EPS updates and thereby will be unable to obtain financing. This challenges utility efforts to meet load growth and insure system reliability.

Response: There are several pieces of information that counter the above claim. First, S4a and S4b indicate that the existing newer (4 to 10 years old) CCCTs in the region are well under the proposed EPS of 980 lb/MWh and are likely to remain below the standard for some time. Second, as stated above several factors are and will continue to direct utilities and IPPs to select the most efficient and cleanest CCCTs. These future CCCTs will have GHG emission rates that are significantly lower than the values shown for the newer CCCTs in the existing fleet (see S4a) and even slightly lower, than the emission rates for the very best new CCCTs presented in S1¹⁵. Finally, since CCCTs are a mature technology, future improvements in efficiency will be small and consequently future EPS updates are not

¹⁴ New York State has established an EPS for new generation of 925 lb/MWh. Canada has an EPS of 926 lb/MWh for new and existing generation units, while the U.K. EPS is set at 992 lb/MWh for new units. The U.S. EPA has a proposed a national EPS of 1000 lb/MWh for new generation units.

¹⁵ Note that the emission values in S1 are calculated with the very conservative EPS survey methodology and forecasts emission values for a new CCCT that is performing as if it were 15 plus years old, in need of maintenance, and subject to a challenging operation cycle.

expected to change the standard much: see S6 for a brief discussion. Commerce is forecasting that the next update of the EPS, covering years 2018-22, will be around 965 lb/MWh. This forecast value is shown in by Supporting Information S4b and does not seem to imply non-compliance for the existing CCCT fleet¹⁶.

Commerce believes that long-term financing for future CCCTs will not be negatively impacted by the current or future EPS updates.

Stakeholder Concern 4: Existing CCCT will be compromised due to the inability to get financing for maintenance and upgrades.

Response: Although Commerce does not have direct evidence to counter this argument we believe that this is likely not an issue, since expenditures for maintenances and upgrades, though large in absolute terms, are a minor part of the total operating costs of a CCCT over its lifetime. In addition utilities can rate base the cost of CCCT maintenance and upgrades¹⁷.

Stakeholder Concern 5: Because upgrades to CCCTs will trigger the EPS and threaten existing contracts, these upgrades will not be performed threatening the reliability of regional CCCTs.

Response: The EPS is only triggered if the heat input to the facility increases during and upgrade. Efficiency upgrades that do not increase heat inputs would not trigger the EPS. For utility owned CCCTs the potential contract constraint of the EPS does not apply (if servicing utility load) and upgrades whether increasing heat input or not, would not be of concern. Newer CCCTs are well below the proposed EPS update, and upgrades rather than a cause for concern, may be an opportunity to incrementally increase efficiency and reduce GHG emissions. Commerce believes that upgrades in general will not have an adverse impact on system reliability.

Impact on cost to consumers

To evaluate the potential marginal impact of the proposed EPS on the cost of electricity to consumers, Commerce considered the following ownership or contract cases: **1.** a utility owns an existing electric generating resource; **2.** a utility purchases or constructs an electric generating resource; **3.** a utility contracts for electric power from an electric generating resource. In total Commerce has evaluated how consumer cost will be potentially impacted by nine possible combinations (cases) of ownership/contractual status with facility compliance. Consumer cost is ultimately determined by the utilities, which are the same entities regulated by RCW 80.80. Hence the cases are described only from the utility's point of view.

In the list below, “non-compliant” means that the facility supplying power may or may not have met the prior emissions performance standard, but fails to meet the new standard. “Compliant” means the facility meets both the prior and new standard. The statement of cost impact reflects the effect on consumer cost due to the change from the current to the proposed lower emissions

¹⁶ The several proposed CCCTs in the region have even lower emission rates and will not be impacted by the 2017 EPS update.

¹⁷ The investor owned utilities have included maintenance and upgrade costs in their rate making process with the UTC.

performance standard, in other words the marginal impact of the proposed lower emissions performance standard.

1. Utility owns an existing electric generating resource

A utility that owns and operates a CCCT may or may not be impacted by the reduction in the EPS.

- a. If a utility owns and operates an existing, compliant CCCT there will be no impact.
- b. If a utility owns and operates an existing, non-compliant CCCT that serves only its own load there will be no impact.
- c. If a utility owns and operates an existing, non-compliant CCCT, and the utility sells the power to other Washington utilities there is a possible impact in the case where they were previously reliant on the revenue from long-term contracts. Commerce is not aware that such a situation exists in Washington. For the two currently non-compliant CCCTs and Colstrip the EPS update will not change the status quo¹⁸.
- d. If a utility owns and operates an existing, non-compliant CCCT and attempts to sell the facility there is a possible impact as Washington utilities cannot buy the facility and therefore its market value will be impacted. It could be purchased by an IPP and operated in the short-term markets or sell directly to BPA. Commerce finds little indication that the above situation has or will occur, as the trend has been for larger utilities to acquire older CCCTs operated by IPPs and not the reverse.

2. Utility purchases or constructs an electric generating resource.

- a. If a utility builds a compliant CCCT there will be no impact as revealed by Supporting Information S2 showing CCCT efficiency versus cost per kilowatt, and indicates that the more efficient CCCTs are less expensive on a capacity basis. In addition, the more efficient plants, which operate well below the current or proposed EPS, will use less natural gas to generate a given amount of electricity (the largest lifetime cost element of a CCCT facility) so the lifetime levelized cost of electricity production (\$/MWh) is almost certainly lower for the more efficient CCCT's.
- b. A utility builds a non-compliant CCCT. This case is extremely unlikely as other state/federal regulations, such as the requirement for power plants to meet Best Available Control Technology (BACT), already direct builder/owners of future CCCTs to purchase efficient and compliant CCCT designs in order to reduce greenhouse gas emissions. In addition non-compliant power plants are **not allowed under RCW 80.80**. Finally, this investment strategy is not a logical choice since more efficient CCCTs are probably less expensive on a \$/KW basis and certainly are not more expensive, see Supporting Information S2.

3. Utility contracts for power from an electric generating resource.

- a. If a utility continues to enter long-term contracts for power from a compliant CCCT there will be no impact.

¹⁸ Commerce has requested contract information for the years 2009 – 2011 from the state's three IOUs which reveals that 29 percent of CCCT generation servicing load in Washington is under long-term contract¹⁸. The percentage of long-term contract CCCT generation that is newly at risk due to the proposed EPS is 0.6% of WA electric load.

- b. A utility has historically entered long-term contracts for power from a non-compliant CCCT – possible impact associated with the cost difference between the prior resource and its replacement. This contractual change is only triggered when the existing long-term contract expires.

There will only be a cost impact if a utility has historically benefitted from lower cost long-term contracts. Commerce evaluated the amount of long-term contract power utilities have with CCCTs. Supporting Information S5 reveals that only 2.5 percent of Washington's electricity supply is under long-term contract and that only 0.6 percent of supply will be impacted by the EPS update. Commerce does not believe that this small change will have a material effect on cost to consumers.

- c. A utility continues to enter short-term contracts for power from a compliant or non-compliant CCCT – no impact. Commerce's Fuel Mix Disclosure report suggests that roughly 20 percent of CCCT generation is sold through short-term contracts

Only three of the cases above have the potential to impact electricity cost to consumers: **1c** and **1d** and **3b**. **Commerce believes that cases 1c and 1d rarely occur, and that only 3b is likely to occur and that the amount of electric power in this case is too small to significantly increase the cost of electricity to consumers. Hence, Commerce finds the impact of the proposed change in EPS on overall consumer cost to be negligible.**

Commerce received a number of comments from stakeholders expressing concerns about the EPS impact on cost to consumers. A few key comments and Commerce's responses are presented below.

Stakeholder Concern 1: A lower EPS would increase utility reliance on short-term power purchase contracts and affect customer costs.

Response: Information on contractual status of CCCT generation presented in S5 reveals that during calendar years 2009-2011 only 2.5 percent of Washington State's electricity supply was under long-term contract (6.9 percent is from utility owned CCCTs) and that only 0.6 percent, representing the output from one CCCT, will be at risk from the EPS update. Recent UTC proceeding indicate that this one CCCT will soon be purchased by a utility to serve its own electric load, thereby totally eliminating the concern about being pushed to short-term contracts by the EPS update.

Stakeholder Concern 2: A lower EPS would increase utility reliance on non-baseload resources, including simple cycle combustion turbines, and affect customer costs.

Response: Information is presented in S7 that summarizes the build forecasts for the three IOUs through 2023. This information is derived from their 2011 Integrated Resource Plans and predates the EPS update process by nearly two years. The IOUs have already made long-term plans to primarily rely on simple-cycle turbines for capacity additions over the next ten years: 388 MW of planned CCCT additions versus 1524 MW of simple cycle turbines. PacifiCorp does plan to build several CCCTs, but this is primarily to serve load growth in other states. Washington's prorated share of PacifiCorp's new CCCTs amounts

to the equivalent of roughly one new CCCT. Avista plans to add a CCCT but the build date is just outside of the 10 year evaluation period. Commerce does not believe that the proposed EPS update will measurably alter utility decisions about whether to select CCCT or simple-cycle technology.

Stakeholder Concern 3: A lower EPS would decrease the utilization of existing regional CCCTs, possibly stranding many of these assets and affect system reliability and customer costs.

Response: Commerce does not believe that the proposed EPS update will decrease utilization of existing CCCTs. Information presented in S5 illustrates that over 70 percent of CCCT generation is from utility owned CCCT facilities and that a relatively small share is in the form of long-term contract power that will be potentially impacted by the proposed EPS update.

Stakeholder Concern 4: A lower EPS would accelerate the construction of new CCCTs and affect customer costs.

Response: Information in S4a reveals that most regional CCCTs will meet the proposed EPS update and therefore will not need to be replaced. Of the two CCCTs that are at risk from the proposed EPS update, one is already owned by a utility and the other will soon be purchased by a utility. These two facilities can continue to serve utility electric load unaffected by the EPS.

Stakeholder Concern 5: A lower EPS would indirectly increase utility reliance on out-of-state resources, affecting system reliability and customer costs.

Response: In the short term, this comment has merit if Washington utilities enter new contracts with existing, out-of-state, low GHG emission CCCTs to comply with the EPS. Since a relatively small amount of in-state electricity generation (0.6 percent for 2009-2011, perhaps zero by 2013) is at risk from the proposed EPS update, Commerce does not believe that this outcome is likely.

In the long term, this comment would be suggesting that future CCCT facilities won't be built in Washington because of the proposed EPS update. This seems unlikely since future new CCCTs will emit far below the proposed EPS update level, and since the EPS also applies to long-term contracts with out-of-state resources.

Stakeholder Concern 6: New generators will not be built in Washington because the lowered EPS will discourage project financing.

Response: Simply lowering the EPS from 1100 to 980 lb/MWh does not change the legal context of financing decisions. The EPS law has been in place for five years, during which Commerce has found no evidence of the law impacting generator financing decisions.

Financiers may find the EPS law of little concern for the following reasons:

- a. Utilities and IPPs are selecting the cleaner and more efficient CCCTs due to the federal BACT requirement.
- b. Utilities and IPPs are selecting the cleaner and more efficient CCCTs because they are less expensive on a per kilowatt capacity basis as shown by Supporting Information S2.
- c. Future EPS updates will only be incrementally lower since CCCT efficiency gains, the primary factor that will drive a lower future EPS, are anticipated to be small over the next 5 years: see Supporting Information S6.

Stakeholder Concern 7: Independent Power Providers are also restricted by the law,¹⁹ but are not included in the Reliability and Cost Consideration.

Response: Commerce is required to consider overall costs to electricity customers. Electricity customers receive their electricity from, and pay their bills to, utilities. Hence evaluating the impact through the utility lens is sufficient.

In the very long term, the law may impact utility costs if it reduces the number of (new) IPP generators from which utilities can choose to purchase electricity. But for the reasons outlined in cases **2a** and **2b** above, an IPP would be highly unlikely to build a non-compliant generator whether or not the EPS existed.

Stakeholder Concern 8: Commerce does not consider a scenario where there is a change in ownership share at an investor owned CCCT.

Response: The law is clear that all existing power plants were grandfathered into compliance until they have an action that triggers²⁰ compliance with the law and regulation. Ecology addressed this situation in WAC 173-407.

For the CCCTs that exceed the current EPS, the proposed EPS update will not change their status. Most of the CCCTs in chart S4b are well below the current EPS of 1,100 lb/MWh and the proposed EPS of 980 lb/MWh, and will therefore be able to comply with the law if a change of ownership occurs. The two marginal CCCTs shown in S4b are in a different situation and the law will restrict future changes in ownership for these facilities. This restriction may produce a slight upward pressure on prices.

Summary

In this document Commerce has considered the marginal effects on system reliability and cost to consumers of the proposed reduction from the current EPS of 1,100 lb/MWh to a proposed

¹⁹ Though RCW 80.80 is primarily designed to regulate utilities, paragraph 80.80.040(3)(b) additionally requires all baseload electric generation that commences operation after June 30, 2008 to comply with the standard, regardless of ownership type.

²⁰ An upgrade resulting in an increase in heat input to a CCCT can also trigger the EPS.

value of 980 lb/MWh. Commerce concludes that the proposed EPS will not impact system reliability or cost to consumers. Highlights from the argument supporting these conclusions are:

1. The proposed EPS is quite lenient and most CCCTs in the Northwest are safely below the proposed EPS as shown in S4a and S4b.
2. Most CCCTs in the Northwest are owned by utilities and serve their own electric load as shown in S5. In this ownership situation the EPS does not have any operational impact on compliant or non-compliant CCCTs.
3. The update of the EPS puts a long-term power contract with a single IPP owned CCCT at risk. As shown in S5 the amount of power at risk is small, only 0.6 percent of Washington's electric load. This facility still has the option of entering short-term power contracts.
4. Future CCCTs built in the Northwest will likely emit far below the proposed EPS update meaning that financing of these projects should not be a challenge.
5. Future updates of the state EPS will see only small changes, driven primarily by advances in CCCT efficiency and the survey adjustment parameters. This means future and most existing CCCTs will be able to comply with future EPS updates for an extended period.

Commerce does not have the detailed information or analytical resources to evaluate individual impacts for each utility. In the event that extraordinary reliability or cost impacts affect one utility, the law provides for exemptions in paragraphs 80.80.060(4) (IOUs) and 80.80.070(4) (consumer-owned utilities).